

CLAIMS

I claim:

1. A contoured structural member, comprising:

at least one contoured inner layer comprising a composite material or a metal-containing material;

at least one contoured outer layer comprising a composite material or a metal-containing material;

at least one intermediate layer having a ribbed structure connecting the at least one inner layer and the at least one outer layer; and

a coating.

2. The structural member of claim 1, wherein the structural member has a closed configuration.

3. The structural member of claim 1, wherein the metal-containing material is a light metal or alloy thereof.

4. The structural member of claim 1, wherein the metal-containing material is a heavy metal or alloy thereof.

5. The structural member of claim 1, wherein the coating is located on the outer surface, the inner surface, or both.

6. The structural member of claim 1, wherein the coating is located between the at least one inner layer and the at least one intermediate layer, between the at least one outer layer and the at least one intermediate layer, or both.

7. The structural member of claim 1, wherein the coating is incorporated within the at least one inner layer, within the at least one intermediate layer, within the at least one outer layer, or any combination thereof.

8. The structural member of claim 1, wherein the coating modifies the friction, magnetic, chemical properties, or conductivity properties of the at least one inner, at least one intermediate layer, the at least one outer layer, of any combination thereof.

9. The structural member of claim 1, wherein the coating comprises Teflon.

10. The structural member of claim 1, wherein the ribbed structure of the at least one intermediate layer comprises a honeycomb structure.

11. The structural member of claim 1, further comprising at least one initiator.

12. The structural member of claim 1, wherein the composite material is a reinforced resin matrix material.

13. The structural member of claim 12, wherein reinforced resin matrix material comprises at least one prepreg ply.

14. The structural member of claim 1, wherein both the at least one inner layer and the at least one outer layer comprise a composite material.

15. The structural member of claim 1, wherein both the at least one inner layer and the at least one outer layer comprise a metal-containing material.

16. The structural member of claim 1, wherein the at least one inner layer comprises a composite material and the at least one outer layer comprises a metal-containing material.

17. The structural member of claim 1, wherein the at least one inner layer comprises a

metal-containing material and the at least one outer layer comprises a composite material.

18. A contoured structural member, comprising:

at least one contoured inner layer comprising a composite material or a metal-containing material;

at least one contoured outer layer comprising a composite material or a metal-containing material;

at least one intermediate layer having a honeycomb structure connecting the at least one inner layer and the at least one outer layer; and

a coating modifying the friction, magnetic, chemical resistance, or conductivity properties of the at least one inner, at least one intermediate layer, the at least one outer layer, of any combination thereof.

19. A closed, contoured structural member, comprising:

at least one contoured inner layer comprising a composite material or a metal-containing material;

at least one contoured outer layer comprising a composite material or a metal-containing material;

at least one intermediate layer having a honeycomb structure connecting the at least one inner layer and the at least one outer layer; and

a coating modifying the friction, magnetic, chemical resistance, or conductivity properties of the at least one inner, at least one intermediate layer, the at least one outer layer, of any combination thereof.

20. A closed, contoured structural member, comprising:

at least one contoured inner layer comprising a composite material or a metal-containing material;

at least one contoured outer layer comprising a composite material or a metal-containing material;

at least one intermediate layer having a honeycomb structure being substantially contiguous with the at least one inner layer and the at least one outer layer; and

a coating modifying the friction, magnetic, chemical resistance, or conductivity properties of the at least one inner, at least one intermediate layer, the at least one outer layer, of any combination thereof.

21. A method for making a contoured structural member, comprising:

providing at least one inner layer comprising a composite material or a metal-containing material;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure;

providing at least one outer layer over the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer; and

connecting the at least one inner and outer layer to the at least one intermediate layer;

22. The method of claim 21, including providing the at least one inner layer by roll

wrapping the at least one inner layer over a substrate.

23. The method of claim 22, including providing the at least one outer layer by roll wrapping the at least one outer layer over the at least one intermediate layer.

24. The method of claim 23, further including removing the substrate.

25. The method of claim 24, including partially or completely filling the interior created by removing the substrate.

26. The method of claim 25, further including constraining the at least one outer layer when connecting the at least one inner and at least one outer layer to the at least one intermediate layer prior to removing the substrate.

27. The method of claim 26, including constraining the at least one outer layer by roll wrapping at least one layer of a shrink-wrap material over the at least one outer layer.

28. The method of claim 27, including removing the at least one layer of the shrink-wrap material after the reaction.

29. The method of claim 27, further including providing at least one pressure distributor over the at least one outer layer.

30. The method of claim 29, including providing a plurality of layers of shrink-wrap material with the at least one pressure distributor between two of said layers.

31. A method for making a contoured structural member, comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;

connecting the at least one inner and outer layer to the at least one intermediate layer; and
removing the substrate.

32. The method of claim 31, including providing the coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer before said layer is roll wrapped.

33. The method of claim 31, including providing the coating on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer after said layer is roll wrapped.

34. A method for making a contoured structural member, comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;
constraining the outer portion with a shrink-wrap material;
connecting the at least one inner and outer layer to the at least one intermediate layer; and
removing the shrink-wrap material and the substrate.

35. A method for making a contoured structural member, comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer having a honeycomb structure to be substantially contiguous with the at least one inner layer; and

roll wrapping at least one outer layer to be substantially contiguous with the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;

constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate layer; and
removing the shrink-wrap material and the substrate.

36. A contoured structural member made by the method comprising:

providing at least one inner layer comprising a composite material or a metal-containing material;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure;

providing at least one outer layer over the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

connecting the at least one inner and outer layer to the at least one intermediate layer;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer.

37. A contoured structural member made by the method comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;

connecting the at least one inner and outer layer to the at least one intermediate layer; and
removing the substrate.

38. A contoured structural member made by the method comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;

constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate layer; and removing the shrink-wrap material and the substrate.

39. A contoured structural member made by the method comprising:

roll wrapping at least one inner layer comprising a composite material or a metal-containing material over a substrate;

roll wrapping at least one intermediate layer having a honeycomb structure to be substantially contiguous with the at least one inner layer; and

roll wrapping at least one outer layer to be substantially contiguous with the at least one intermediate layer, the at least one outer layer comprising a composite material or a metal-containing material;

providing a coating in or on the at least one inner layer, the at least one intermediate layer, or the at least one outer layer;

constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate layer; and

removing the shrink-wrap material and the substrate.